And 3% of $.97=.02\frac{91}{100}$.
$97\%+2\frac{91}{100}\%=99\frac{91}{100}\%$=cost on repurchasing.
Loss is $100\%-(97-2\frac{91}{100})\%=5\frac{91}{100}\%$.
$\therefore 5\frac{91}{100}\%=\$12.00$.
Then $1\%=\$2.0305$.
And $100\%=\$203.05$.

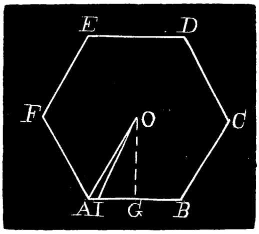
4. I. What is the number of acres in a field in the form of a regular hexagon, if it contains as many acres as there are boards in the fence inclosing it, the boards being $l=8\sqrt[4]{3}$ feet long and the fence $n=6$ boards high?

Solution by B. F. FINKEL, Professor of Mathematics in Kidder Institute, Kidder, Missouri.

Construction.— Let $ABCDEF$ be the field, O the center, AI the length of a panel of the fence. Connect A and I with the center of the field by the lines AO and IO. Draw OG perpendicular to the side AB. Then

II.

1. $AI=8\sqrt[4]{3}$ feet, and
2. *area* of $AOI=6A=261360$ sq.ft., since there are as many acres in the field as there are boards in the fence inclosing it and the panel being 6 boards high.
3. $\frac{1}{2}(AI\times OG)$=the area of the triangle $AOI=\frac{1}{2}(8\sqrt[4]{3}\times OG)=4\sqrt[4]{3}\times OG$.
4. $\therefore 4\sqrt[4]{3}\times OG=261360$, the number of square feet in the triangle AOI, whence
5. $OG=261360\div 4\sqrt[4]{3}=\dfrac{65340}{4\sqrt[4]{3}}$. But
6. $OG=\sqrt{[AO^2(=AB^2)-AG^2(=\frac{1}{2}AB)^2]}$ $=\frac{1}{2}AB\sqrt{3}$.
7. $\therefore \frac{1}{2}AB\sqrt{3}=\dfrac{65340}{4\sqrt[4]{3}}$, whence
8. $AB=\dfrac{130680}{\sqrt[4]{3^3}}$ ft., the length of a side of the field. Then
9. $\dfrac{130680}{\sqrt[4]{3^3}}\div 8\sqrt[4]{3}=5445$, the number of panels on a side, and
10. $6\ (6\times 5445)=196020$, the number of acres in the field.



III. $\therefore$ There are 196020 acres in the field.

Remark.— If we let l=the length of a rail and n, the number of rails in a panel, the number of acres in a hexagonal field will be $174240n^2\div l^2\sqrt{3}$. From the nature of the problem, n must be integral. $\therefore$ The number of acres and the length of the rails can not both be rational. The above solution is also applicable when the field is in the form of a square.

PROBLEMS.

5. **Proposed by E. E. KINNEY, Anaconda, Montana.**

A board is 16 in. long and 9 in wide. How may it be cut in two parts that the parts joined together may form a square?

6. **Proposed by B. F. FINKEL, Professor of Mathematics in Kidder Institute, Kidder, Missouri.**

What is the volume of a regular pentagonal pyramid,each side of whose base is 10 feet and the altitude 20 feet?

7. If an article had cost me 10% less, the gain would have been 12% more; what was the gain per cent.? [Selected from *Brook's Higher Arithmetic.*]

8. **Proposed by EARL D. WEST, West Middleburg, Logan County, Ohio.**

The number of men in a side rank of a solid body of militia is to the number of men in the front rank as 2 is to 3; if the length and breadth be increased so as to number each 4 men more, the whole body will then contain 2320 men. How many men in the militia?

9. **Proposed by O. S. KIBLER, Superintendent of Schools, West Middleburg, Logan County, Ohio.**

Four logs of uniform thickness whose diameters are each 4 feet, lie side by side and touch each other. In the crevices of these logs lie three logs 3 feet in diameter, and in the crevices of the three logs lie two logs whose diameters are 2 feet. What must be the diameter of a log to lie on the top of the pile and touch the two logs and the middle one of the three logs?

10. **Proposed by MISS LEOTA MILLER, B. L., Professor of Natural Science and Art, Kidder Institute, Kidder, Missouri.**

A carpenter is obliged to cut a board,that is in the form of a trapezoid,crosswise into two equivalent parts. The board is 12 ft. long, 2 ft. wide at one end, and one foot wide at the other. How far from the narrow end must he cut?

11. **Proposed by L. B. HAYWARD, Superintendent of Schools, Bingham, Ohio.**

What length of rope will be required to draw water from a well, it being 38 feet to the water, the sweep to be supported by an upright post 20 feet high, and standing 20 feet from the well, and the foot of the sweep to strike the ground 20 feet from the foot of the upright post?

ALGEBRA.

Conducted by J. M. COLAW, Monterey, Va. All contributions to this department should be sent to him.

SOLUTIONS TO PROBLEMS.

1. **Proposed by W. L. HARVEY, Portland, Maine.**

$(2x^2-1)^2-(2x^2-4x-1)(2x^2-1)=1$; find the value of x by quadratics.

Solution by the Proposer.

Performing the opperations indicated and collecting, the equation reduces to $8x^3-4x=1$. Multiplying both sides of this equation by $8x$ and adding $16x^2+1$ to both sides of the resulting equation, we have $64x^4-16x^2+1=16x^2+8x+1$, from which $8x^2-1=4x+1$. Then $8x^2-4x=2$, from which $x=\frac{1}{4}(1\pm\sqrt{5})$. Using the minus sign this will prove true.

2. **Proposed by Professor P. H. PHILBRICK, C. E., Lake Charles, Louisiana.**

Find x from the equation, $x^3+18x=1529$.

Solution by the Proposer.

Multiply by x, then $x^4+18x^2=1529x=139\times11x$. Again, x^4+139x^2+